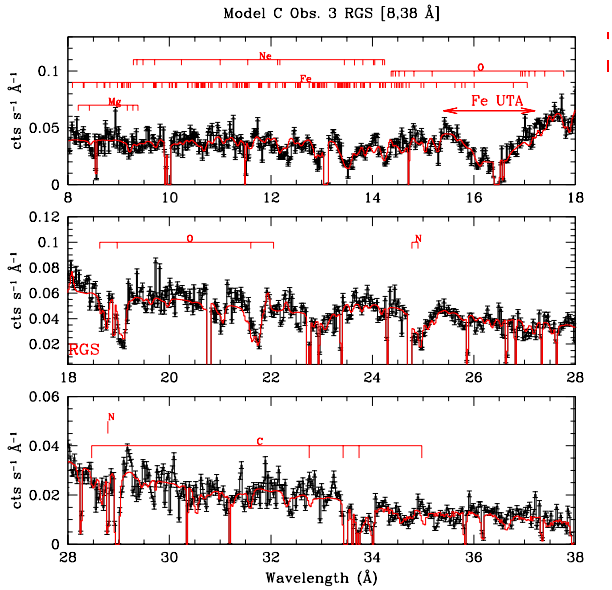

Fig. 1. Three-phase absorbed model (red) plotted over RGS spectum of the first XMM-Newton observation. Absorption transitions are marked in the top (red).

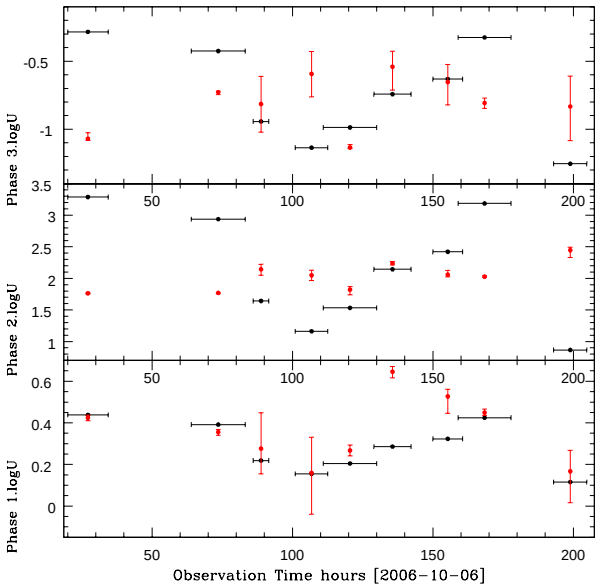

Fig. 2. Log of the ionization parameter of each phase as a function of time (red). For an easy comparison, the black points represent the flux [1, 7 keV] scaled.

the second with a low ionization degree –*phase 2*– (log $U \sim -1$), and the last one –*phase 3*– of high ionization degree (log $U \sim 1.7$). For all phases, the absorbing gas is in outflow but with velocities from 500 km s^{-1} to 2500 km s^{-1}. Also, our model contains the FeKα line, the Fe complex and nine emission lines in the soft X-ray band. Figure 1 shows the model fit and the RGS spectra in the first observation of XMM-Newton. We used the PHASE photoionization code of Krongold et al. (2003) to fit the WA. The ionization paremeter is defined as $U = \frac{Q}{4\pi R^2 n_e c}$, where Q is the ionizing photons luminosity in 0.013-100 keV range, R the distance between the black hole and the accretion disk system to WA location, n_e the electronic density and c the light speed. The model was successfully applied in the Chandra contemporary spectra. With this analysis we have the spectral components of nine observations performed in a time variability study of six days.

The flux variation can be explained by a variable continuum emission among the nine observations. We discovered that *phase 1* is responding to this continuum variation throught its ionization degree, as it can be saw in Figure 2, where the flux is scaled to compared its change with the ionization degree evolution.

Phase 1 response is very usefull to estimate the electronic density n_e and the distance R. We have two timescales to constrain these parameters, the first one is the photoionization equilibrium –PE– time, it can be estimated from Figure 2, the WA responds in PE during obs 2 to 4 –in chronological order– $t_{\rm eq,1} = 126$ ksec. The second timescale occurs when the WA lost PE, among the obs 6 and 7 $t_{\rm eq,2} = 72$ ksec. Using the relation between $t_{\rm eq}$ and n_e proposed by Nicastro et al. (1999), we estimated the electronic densities $n_{e,1} \sim 2.41 \times 10^6$ cm^{-3} and $n_{e,2} \sim 4.22 \times 10^6$ cm^{-3} for both timescales, therefore the WA distance is in the range 5.61×10^{15} cm to 1.04×10^{16} cm (2.2–4 light days).

We did a deeper analysis to study the spectra response to the continuum change with different flux states of XMM-Newton observations. This work will be presented in a forthcoming paper (Huerta, E. M., et al., 2011 in preparation).

REFERENCES

Keel, W. C. 1996, AJ, 111, 696
Krongold, Y., Nicastro, F., Brickhouse, N. S., Elvis, M., Liedahl, D. A., & Mathur, S. 2003, ApJ, 597, 832
Markowitz, A., et al. 2008, PASJ, 60, 277
Mehdipour, M., Branduardi-Raymont, G., & Page, M. J. 2010, A&A, 514, A100
Nicastro, F., Fiore, F., Perola, G. C., & Elvis, M. 1999, ApJ, 512, 184
Piconcelli, E., Jimenez-Bailón, E., Guainazzi, M., Schartel, N., Rodríguez-Pascual, P. M., & Santos-Lleó, M. 2004, MNRAS, 351, 161
Turner, T. J., Reeves, J. N., Kraemer, S. B., & Miller, L. 2008, A&A, 483, 161